WHAT IS CLAIMED IS:

1. An optical cross-connect switch for switching optical communications signals, the switch comprising:

a first pattern projector configured to project one or more first control signal radiation patterns;

a plurality of output optical channels;

a plurality of output encoders, each output encoder associated with one of the plurality of output optical channels, each output encoder positioned, relative to the associated output optical channel and the first pattern projector, to receive the one or more first control signal radiation patterns and to detect at least a portion of one or more corresponding output Moiré interference patterns produced by the one or more first control signal radiation patterns;

wherein each output encoder is configured to generate a corresponding output control signal indicative of an intensity of detected output Moiré interference patterns.

2. A switch according to claim 1 wherein each output encoder comprises an associated output reticle, each output reticle having a spatially varying pattern of interaction with radiation incident thereon.

3. A switch according to claim 2 wherein each output reticle is positioned to receive the one or more first control signal radiation patterns and to produce the one or more corresponding output Moiré interference patterns in response thereto.

4. A switch according to claim 3 wherein each output encoder comprises an associated output radiation sensor, each output radiation sensor positioned to detect at least a portion of the one or more corresponding output Moiré interference patterns and configured to generate the corresponding output control signal.

5. A switch according to claim 4 comprising:

a second pattern projector configured to project one or more second control signal radiation patterns;

a plurality of input optical channels;

a plurality of input encoders, each input encoder associated with one of the plurality of input optical channels, each input encoder positioned, relative to the associated input optical channel and the second pattern projector, to receive the one or more second control signal radiation patterns and to detect at least a portion of one or more corresponding input Moiré interference patterns produced by the one or more second control signal radiation patterns;

wherein each input encoder is configured to generate a corresponding input control signal indicative of an intensity of detected input Moiré interference patterns.

6. A switch according to claim 5 wherein each input encoder comprises an associated input reticle, each input reticle having a spatially varying pattern of interaction with radiation incident thereon.

7. A switch according to claim 6 wherein each input reticle is positioned to receive the one or more second control signal radiation patterns and to produce the one or more corresponding input Moiré interference patterns in response thereto.

8. A switch according to claim 7 wherein each input encoder comprises an associated input radiation sensor, each input radiation sensor positioned to detect at least a portion of the one or more corresponding input Moiré interference patterns and configured to generate the corresponding input control signal.

9. A switch according to claim 8 comprising a controller connected to receive the input and output control signals, the controller configured to determine a position of each output reticle based on the corresponding output control signal and configured to determine a position of each input reticle based on the corresponding input control signal.

10. A switch according to claim 4 comprising a controller connected to receive the output control signals, the controller configured to determine a position of each output reticle based on the corresponding output control signal.

11. A switch according to claim 4 wherein each of the output reticles has a spatially varying transmissivity and each associated output radiation sensor is located to detect radiation from the one or more first control signal radiation patterns that has passed through the associated output reticle.

12. A switch according to claim 4 wherein each of the output reticles has a spatially varying reflectivity and each associated output radiation sensor is located to detect radiation from the one or more first control signal radiation patterns that has reflected from the associated output reticle.

13. A switch according to claim 4 wherein each output reticle is patterned with a regular array of cells.

14. A switch according to claim 13 wherein each of the cells comprises an aperture portion and an opaque portion and wherein each output reticle passes a first proportion of the first control signal radiation patterns incident on the aperture portion to the associated output radiation sensor and each output reticle passes a second proportion, smaller than the first proportion, of the first control signal radiation patterns incident on the opaque portion to the associated output radiation sensor.

15. A switch according to claim 4 wherein each output reticle comprises a circularly symmetric pattern of aperture areas and opaque areas and wherein each output reticle passes a first proportion of the first control signal radiation patterns incident on the aperture areas to the associated output radiation sensor and each output reticle passes a second proportion, smaller than the first proportion, of the first control signal radiation patterns incident on the opaque areas to the associated output radiation sensor.

16. A switch according to claim 4 wherein each of the one or more first control signal radiation patterns comprises a plurality of elongated stripes of radiation.

17. A switch according to claim 4 wherein each of the one or more first control signal radiation patterns comprises a spatially periodic radiation pattern.

18. A switch according to claim 13 wherein each of the one or more first control signal radiation patterns comprises a spatially periodic radiation pattern having a period substantially equal to a spatial periodicity of the cells on the output reticles.

19. A switch according to claim 18 wherein the cells on the output reticles are arranged in rows extending substantially parallel to a first axis and columns extending substantially parallel to a second axis and each of the one or more first control signal radiation patterns comprises elongated stripes which are oriented substantially parallel to one of the first and second axes.

20. A switch according to claim 4 wherein the one or more first control signal radiation patterns comprise at least one radiation pattern having a first wavelength and at least one radiation pattern having a second wavelength.

21. A switch according to claim 4 wherein the first pattern projector comprises an array of first radiation emitting devices located in positions optically opposing the plurality of output optical channels.

22. A switch according to claim 21 wherein the first pattern projector is configured to project the one or more first control signal radiation patterns by turning on selected pluralities of the first radiation emitting devices.

23. A switch according to claim 4 wherein each output encoder comprises an associated output lens, each output lens located to focus the one or more first control signal radiation patterns onto the associated output reticle.

24. A switch according to claim 23 wherein each output lens is also located to couple an optical communication signal from a selected one of a plurality of input optical channels into the associated output optical channel.

25. A switch according to claim 4 wherein each output reticle is coupled to move with the associated output optical channel, and wherein the one or more corresponding output Moiré interference patterns vary in intensity based on a position of the associated output reticle.

26. A switch according to claim 25 wherein the output optical channels comprise optical fibers.

27. A switch according to claim 4 wherein each output reticle is coupled to move with an associated moveable optical element, and wherein the one or more corresponding output Moiré interference patterns vary in intensity based on a position of the associated output reticle.

28. A switch according to claim 27 wherein a position of each moveable optical element influences an optical path of an optical communication signal coupled into the associated output optical channel.

29. A switch according to claim 28 comprising a controller connected to receive the output control signals from the output radiation sensors, the controller configured to determine a position of each moveable optical element based on the corresponding output control signal.

30. A switch according to claim 4 comprising a plurality of output actuators, each output actuator associated with one of the plurality of output optical channels and each output actuator comprising: a magnetic member coupled to move with the associated output optical channel and a plurality of magnetically polarizable branches spaced apart around the magnetic member.

31. A switch according to claim 30 wherein each magnetic member is circularly symmetric.

32. A switch according to claim 30 wherein each magnetic member comprises a ring of magnetic material.

33. A switch according to claim 32 wherein each ring extends around a peripheral edge of the associated output reticle.

34. A switch according to claim 30 wherein each output actuator comprises four branches equally spaced apart around the magnetic member.

35. An optical switch comprising a system for independently determining positions of each of a plurality of optical fibers in the optical switch, the system comprising:

a plurality of reticles each coupled to move with a corresponding one of the optical fibers, each of the reticles having a spatially varying pattern of interaction with radiation incident on the reticle;

a pattern projector configured to project first and second radiation patterns onto all of the plurality of reticles; and

a plurality of radiation sensors, each of which is associated with a reticle, each radiation sensor located to generate a control signal indicative of an intensity of radiation of the first and second radiation patterns which has interacted with the associated reticle.

36. An optical switch according to claim 35 comprising a data processor connected to receive the control signal from each of the radiation sensors and configured to compute a position of the associated reticle from the control signal.

37. An optical switch according to claim 35 wherein each reticle has spatially varying transmissivity and the associated radiation sensor is located to detect radiation from the pattern projector which has passed through the reticle.

38. An optical switch according to claim 35 wherein each reticle has spatially varying reflectivity and the associated radiation sensor is located to detect radiation from the pattern projector which has been reflected from the reticle.

39. An optical switch according to claim 36 wherein each reticle is patterned with a regular array of cells.

40. An optical switch according to claim 39 wherein each of the cells comprises an aperture portion and an opaque portion and wherein each reticle passes a first proportion of radiation incident on the aperture portion from the pattern projector to the associated radiation sensor and each reticle passes a second proportion, smaller than the first proportion, of the radiation incident on the opaque portion from the pattern projector to the associated radiation sensor.

41. An optical switch according to claim 39 wherein the first and second radiation patterns comprise spatially periodic patterns having periods equal to a spatial periodicity of the cells.

42. An optical switch according to claim 41 wherein the cells are arranged in rows extending substantially parallel to a first axis and columns extending substantially parallel to a second axis and the first and second radiation patterns respectively comprise

elongated stripes oriented substantially parallel to the first and second axes.

43. An optical switch according to claim 35 comprising a lens associated with each of the optical fibers, wherein each lens is located to focus the first and second radiation patterns onto the associated reticle.

44. An optical switch according to claim 43 wherein each lens is located to focus optical communication signals into an end of the associated optical fiber.

45. An optical switch according to claim 35 comprising an actuator associated with each of the plurality of optical fibers, each actuator comprising a magnetic member coupled to move with the associated optical fiber and a plurality of magnetically polarizable branches spaced apart around the magnetic member.

46. An optical switch according to claim 36 wherein the interaction between each reticle and the first radiation pattern creates an associated first Moiré interference pattern and wherein the radiation sensor associated with the reticle is located to detect an intensity of the associated first Moiré interference pattern and to generate the control signal in response thereto.

47. An optical switch according to claim 46 wherein the interaction between each reticle and the second radiation pattern creates an associated second interference pattern and wherein the radiation sensor associated with the reticle is located to detect an intensity of the associated second Moiré interference pattern and to generate the control signal in response thereto.

48. A method for coupling an input optical communication signal into an output optical channel selected from among a plurality of output optical channels, the method comprising:

generating one or more output Moiré interference patterns using first control signal radiation, the one or more output Moiré interference patterns varying with a position of a selected moveable output optical element, the selected moveable output optical element associated with the selected output optical channel;

detecting at least a portion of the one or more output Moiré interference patterns; and

based at least in part on the detected portion of the one or more output Moiré interference patterns, determining the position of the selected moveable output optical element.

49. A method according to claim 48 wherein the selected moveable output optical element comprises a selected moveable output optical fiber and determining the position of the selected moveable output optical element comprises determining a position of an end of the selected moveable output optical fiber.

50. A method according to claim 49 wherein generating one or more output Moiré interference patterns comprises projecting the first control signal radiation onto an output reticle coupled to move with the selected moveable output optical fiber, the output reticle having a spatially varying pattern of interaction with radiation incident thereon.

51. A method according to claim 50 wherein determining the position of the end of the selected moveable output optical fiber comprises determining a position of the output reticle.

52. A method according to claim 51 wherein the input optical communication signal is emitted by a selected input optical channel from among a plurality of input optical channels and wherein the method comprises:

generating one or more input Moiré interference patterns using second control signal radiation, the one or more input Moiré interference patterns varying with a position of an end of a selected moveable input optical fiber, the selected moveable input optical fiber associated with the selected input optical channel;

detecting at least a portion of the one or more input Moiré interference patterns; and

based at least in part on the detected portion of the one or more input Moiré interference patterns, determining the position of the end of the selected moveable input optical fiber.

53. A method according to claim 52 wherein generating one or more input Moiré interference patterns comprises projecting the second control signal radiation onto an input reticle coupled to move with the selected moveable input optical fiber, the input reticle having a spatially varying pattern of interaction with radiation incident thereon.

54. A method according to claim 53 wherein determining the position of the end of the selected moveable input optical fiber comprises determining a position of the input reticle.

55. A method according to claim 51 wherein the output reticle has a spatially varying transmissivity and wherein detecting at least a portion of the one or more output Moiré interference patterns comprises detecting the first control signal radiation that has passed through the output reticle.

56. A method according to claim 51 wherein the output reticle has a spatially varying reflectivity and wherein detecting at least a portion of the one or more output Moiré interference patterns comprises detecting the first control signal radiation that has reflected from the output reticle.

57. A method according to claim 51 wherein the output reticle is patterned with a regular array of cells.

58. A method according to claim 57 wherein each cell comprises an aperture portion and an opaque portion and wherein detecting at least a portion of the one or more output Moiré interference patterns comprises detecting a first proportion of the first control signal radiation that is incident on and passes through the aperture portion and detecting a second proportion, smaller than the first proportion, of the first control signal radiation that is incident on and passes through the opaque portion.

59. A method according to claim 57 wherein projecting the first control signal radiation onto the output reticle comprises projecting one or more spatially periodic radiation patterns onto the output reticle, the spatially periodic radiation patterns having a period substantially equal to a spatial periodicity of the cells on the output reticle.

60. A method according to claim 59 wherein the cells on the output reticle are arranged in rows extending substantially parallel to a first axis and columns extending substantially parallel to a second axis and wherein projecting the first control signal radiation onto the output reticle comprises projecting elongated stripes of radiation which are oriented substantially parallel to one of the first and second axes.

61. A method according to claim 51 wherein projecting the first control signal radiation onto the output reticle comprises imaging a plurality of individual radiation emitting devices onto the output reticle.

62. A method according to claim 51 comprising moving the selected moveable output optical fiber to a position that substantially maximizes the coupling of the input optical communication signal into the selected output optical channel.

63. A method according to claim 48 wherein movement of the selected moveable output optical element influences an optical path that the input optical communication signal travels when coupled into the selected output optical channel.

64. A method according to claim 63 wherein generating one or more output Moiré interference patterns comprises projecting the first control signal radiation onto an output reticle coupled to move with the selected moveable output optical element, the output reticle having a spatially varying pattern of interaction with radiation incident thereon.

65. A method according to claim 64 wherein determining the position of the selected moveable output optical element comprises determining a position of the output reticle.

66. A method according to claim 65 wherein the input optical communication signal is emitted by a selected input optical channel from among a plurality of input optical channels and wherein the method comprises:

generating one or more input Moiré interference patterns using second control signal radiation, the one or more input Moiré interference patterns varying with a position of a selected

moveable input optical element, the selected moveable input optical element associated with the selected input optical channel;

detecting at least a portion of the one or more input Moiré interference patterns; and

based at least in part on the detected portion of the one or more input Moiré interference patterns, determining the position of the selected moveable input optical element.

67. A method according to claim 65 comprising moving the selected moveable output optical element to a position that substantially maximizes the coupling of the input optical communication signal into the selected output optical channel.